Center Independent Research & Development: JPL IRAD

Active Mirrors for High Contrast Imaging

Completed Technology Project (2016 - 2019)

Project Introduction

This effort is focused on implementing active primary mirrors for space-based telescopes. Mirrors of this design have integrated electroactive actuators built into their lightweighted structure to allow for active wavefont correction during telescope operation.

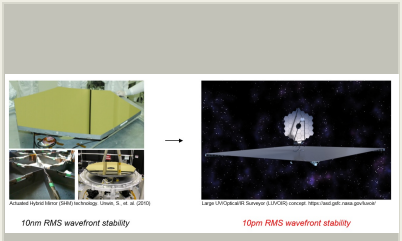
The objective of this effort is to study the use of active primary mirrors for future space-based telescopes Mirrors of this design have the potential to 1) achieve the necessary figure accuracy (~15 nm RMS surface) for UV/optical applications, 2) allow "cold" (35-40K) operation by correcting thermally induced figure changes, and 3) increase stability via active control and/or dynamic energy dissipation. Considerations for operation at even deeper cryogenic temperatures (4K) have also been made for missions operating in the Far-IR regime (i.e. OST). Techniques to measure these mirrors to ultra-precise levels are also under development.

Anticipated Benefits

This technology is highly beneficial to future large-aperture (> 10m dia.) telescopes that require pristine wavefront quality and stability by performing active figure correction of the primary mirror. Specifically, it would enhance the performance of missions that implement coronagraphs for exoplanet detection/characterization.

Commercial earth-observing satelites in the <50cm dia. aperture range have gained widespread popularity in the past decade in order to provide customers with geospatial data in real time. Active mirrors can be applied to these missions in order to increase the quality of this data, thus providing a higher value product to such customers.

Earth-observing telescopes are essential to the national defense of this country. This technology can be applied to non-NASA missions in order to simplify optical manufacturing, increase optical performance (ie. on-orbit correction of wavefront error) and ease system I&T.



Active mirrors for high contrast imaging.

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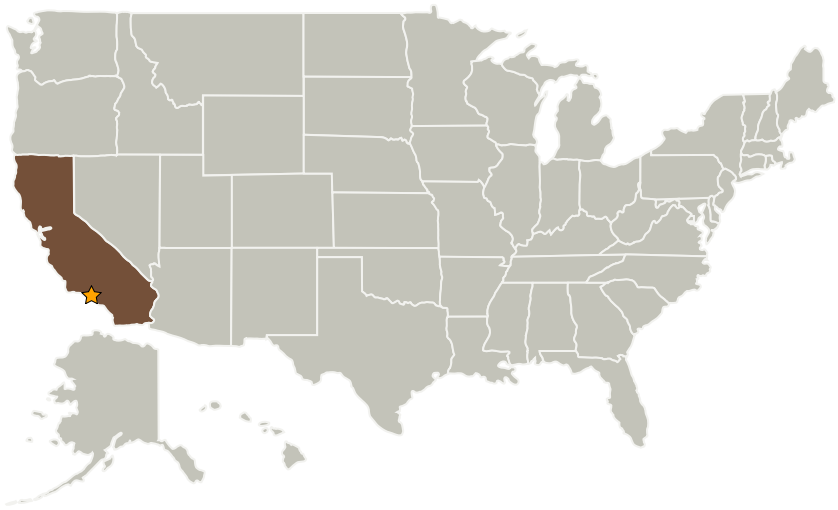
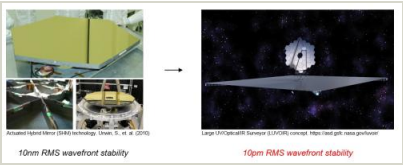
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Images



JPL_IRAD_Activities Project Image
Active mirrors for high contrast imaging.
(https://techport.nasa.gov/image/28004)

Organizational Responsibility

Responsible Mission Directorate:
Mission Support Directorate (MSD)

Lead Center / Facility:
Jet Propulsion Laboratory (JPL)

Responsible Program:
Center Independent Research & Development: JPL IRAD

Project Management

Program Manager:
Fred Y Hadaegh

Project Manager:
Fred Y Hadaegh

Principal Investigator:
John B Steeves

Co-Investigators:
David C Redding
James K Wallace

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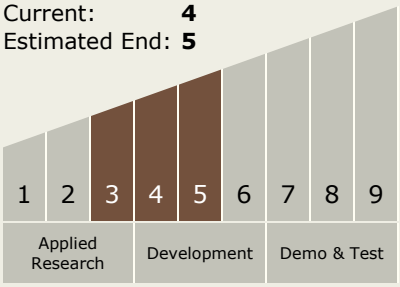
Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

Target Destinations

Earth, The Moon, Others Inside the Solar System

Supported Mission Type

Push